



A REVIEW ON VITEX NEGUNDO L. - AN ETHNO MEDICINALLY IMPORTANT PLANT

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ABSTRACT

Vitex negundo L. (Verbenaceae) is a hardy plant, mainly distributed in the Indian subcontinent. All parts of the plant, from root to fruit, possess a massive amount of phytochemical secondary metabolites which inform a unique variety of medicinal uses to the plant. The presence of secondary metabolites such as alkaloids, flavonoids, terpenoids and phenolic compounds in the various plant parts are dependable for the anti-oxidant, anti-inflammatory, anti-microbial and anti-venom properties which are being revealed in the treatment of various diseases and so on. Cell and tissue culture would offer rapid propagation and conservation of the plant species and, from the position of outlook of phytochemistry, give possibility for enrichment of the quality and quantity of the bioactive secondary metabolites occurring in the plant. This review aims at presenting widespread information on phytochemical constituents and beneficial uses which can be helpful in development of modern medicine.

KEYWORDS: *Vitex negundo*, *In vitro* culture, anti-inflammatory, anti-analgesic Activity

Abbreviations:

IBA	: Indole-3-Butyric Acid
Kn	: Kinetin
NAA	: α -Naphthalene Acetic Acid
BAP	: 6-Benzylaminopurine
TIBA	: 2, 3, 5-Triiodobenzoic Acid

INTRODUCTION

India is blessed with a graceful treasure of medicinal Plants. Medicinal plants have been a chief source of therapeutic agents. Medicinal plants, which are the backbone of traditional medicine. The Medicinal Plants have produced smooth influence to the event of ancient Indian systems of medicine or drugs are conjointly to native medicine among social group etc. India is symbolizes as mass of genetic diversity of medicinal Plant. *Vitex negundo* L. (Verbenaceae) is a hardy plant, flourishing throughout in India. This plant contains number of commercially valuable herbal. The plant is a component of a number of commercially available herbal preparations and has also shown as an active bio-control agent (Ullah *et al.*, 2012).

Taxonomical Classification

Kingdom	- Plantae
Phylum	- Tracheophyta
Class	- Magnoliopsida
Order	- Lamiales
Family	- Verbenaceae
Genus	- Vitex
Species	- negundo

SYNONYMS

Vitex cannabinifolia Siebold & Zucc.

Vitex incisa Lam.

Vitex incisa var. *heterophylla* Franch.

Vitex negundo var. *heterophylla* (Franch.) Rehder

Vernacular Names

Language	Name
English	Five-Leaved Chaste Tree, Indian Privet
Hindi	Samhalu, Saubhalu, Nirgandi
Malayalam	Karinocci
Tamil	Nirkundi, Nallanocci
Telugu	Nallavavilli, Vavili, Tellavavilli
Urdu	Sambhalu, Panjangusht
Arabic	Usraq
Gujarati	Nagoda, Nagaol, Nirgari
Kannada	Nirgundi, Lakkagida, Nekka, Nakkilu
Assamese	Pasutia, Aggla-Chita, Aslok, Pochatia
Bengali	Nisinda, Samalu, Nirgundi, Nishinda, Sinduari
Siddha	Noochi

Plant Description

It is an aromatic deciduous shrub with quadrangular branching that grows three meters' height. The leaves are arranged oppositely and long petioled and digitately 3-5 foliate. Flowers are bluish purple in panicles up to 30cm long. Fruit colour is light brown to black and four seeded with globose or ovoid or obovoid. Roots are cylindrical, hard and irregular fractures present. External surface of

root is rough due to longitudinal, narrow and cracks are seen. Small rootlets are present.(Meena *et al.*, 2011).

Chemical Constituents

Numbers of phytochemical components are present in leaves, flowers and root of *Vitex negundo*. The flower contains oil such as sabiene, linalool, terpinen-4-ol, β -caryophyllene, α -guaiene, 5,3'-dihydroxy-7,8,4'-trimethoxyflavanone and 5,3'-dihydroxy-6,7,4'-trimethoxyflavanone, have been isolated from the leaves of *Vitex negundo* (Achari *et al.*, 1984).

Volatile oils are present in the leaves. Triterpenes, diterpenes, sesquiterpenes, lignan, flavonoids, flavones, glycosides, iridoid glycosides and stilbene derivative. They are friedelin, vitamin C, carotene, casticin, artemetin, sabenine, globulol, α -terpineol, Spathulenol, β - Farnesene, farnesol, α -pinene, β -pinene, linalool and two alkaloid nishindine and hydrocotylene are present a pale yellow oil is obtained from the fresh leaves (Singh *et al.*, 1999). Sehgal *et al.* (1983) reported that '6'-p-hydroxybenzoyl mussaenosidic acid, an iridoid glucoside from *Vitex negundo*.

Betulinic acid and ursolic acid isolated from *Vitex negundo* L. (Chandramu, *et al.*, 2003)

Biological Activities

Kulkarni *et al.* (2008) studied about the anti-inflammatory activity of *V. negundo* using Methanolic extract of leaves. The study was conducted out on Wistar rats using the carrageenan-induced rat paw edema method. (Khan *et al.*, 2018) studied about the isolation of two new bioactive chromone constituents from whole plant of the *Vitex negundo* and their *in vivo* evaluation for anti-inflammatory activity. Another study revealed that the anti-inflammatory activity of *V. negundo* using ethanolic leaf extract carried on Carrageenan induced hind Paw edema and cotton pellet granuloma test in rats (Ramprakash Tandon & Gupta, 2006). Anti-inflammatory activity evaluated by Carrageenan induced paw edema method using ethanolic extract of flowers of *Vitex negundo*(Maniyar & Sriraj, 2017).

Anti-Analgesic Activity

Dharmasiri *et al.* (2003) revealed the oral anti-inflammatory, analgesic and antihistamine properties of mature fresh leaves of *Vitex negundo* L. (Verbenaceae) demanded in the Ayurveda medicine by orally giving an aqueous extract of the leaves to rats. The fresh leaves of *Vitex negundo* have anti-inflammatory and anti-analgesic activities possibly mediated via prostaglandin synthesis inhibition, antihistamine, membrane stabilizing and antioxidant activities.

Anti-Microbial Activity

Devi *et al.* (2008) studied about the antibacterial activity of methanolic, chloroform, fresh and aqueous extracts of *V. negundo*. It was tested against three bacterial strains viz. *Staphylococcus aureus*, *Escherichia coli* and *Klebsiella pneumonia*. The fresh and aqueous extracts of leaves in different dilutions were found to have antibacterial activity against the three bacteria. Another study reported that ethyl acetate and ethanol extracts of seeds of *V. negundo* showed

antibacterial activity against some bacterial strains such as *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli* and *Pseudomonas aeruginosa*. Chowdhury *et al.* (2009) studied about the antibacterial activity of the methanol extract, petroleum ether and carbon tetrachloride fractions of *V. negundo*. Kanamycin was used as standard. From this, ethanolic tetrachloride fractions showed most prominent inhibitory action against *Bacillus megaterium* extracts showed maximum zone of inhibition found against *Bacillus cereus*, *Pseudomonas aeruginosa*, *Salmonella typhi*. Petroleum ether and carbon, *Bacillus subtilis*, *Salmonella typhi* and *Vibrio mimicus*

Anti-Fungal Activity

Anbalagan. S *et al.* (2017) studied the antifungal activity of *Vitex negundo* using ethanolic and methanolic leaf extracts. It exposed a broad spectrum of activity against fungal strains. It showed maximum activity against *Candida albicans*, *Aspergillus niger*, *Cryptococcus neoformans* and *Penicillium sp.*

Anti-Antioxidant Activity

Kulkarni *et al.* (2008) demonstrated that the solid relationship among anti-inflammatory and antioxidant activities of *V. negundo*. The methanol extract exhibited a strong free radical scavenging activity by 1,1-diphenyl-2-picrylhydrazyl method and produced a significant reduction in the formation of thiobarbituric acid reacting substances when assessed for its lipid peroxidation inhibitory activity. The results intensely put forward that radical quenching may be one of the mechanisms in control for its anti-inflammatory activity. Shubha *et al.* (2016) studied about the antioxidant and antileukemic activity of *Vitex negundo* leaf extracts, chloroform fraction of *V. negundo* leaf has both antioxidant and antileukemic activity.

Enzyme-inhibitory activity:- Root extracts of *Vitex negundo* showed inhibitory activity against various enzymes such as lipoxygenase and butyryl-cholinesterase) (Neha *et al.*, 2021); α -chymotrypsin (Lodhi *et al.*, 2008); xanthine-oxidase (UmaMaheswari *et al.*, 2007) and tyrosinase (Azhar-Ul-Haq *et al.*, 2006). Woradulayapinij *et al.* (2005) reported the water extract of the aerial parts of *Vitex negundo* showed inhibitory activity against the HIV type 1 reverse transcriptase

Effect on reproductive potential:- The flavonoid rich fraction of seeds of *Vitex negundo* caused disruption of the latter stages of spermatogenesis in dogs (Bhargava, 1989) and interfered with male reproductive function in rats (Das *et al.*, 2004). It must however be noted that these findings are in quick difference with the traditional use of *Vitex negundo* as aphrodisiac. (Hu *et al.*, 2007) determined that ethanolic extracts of *Vitex negundo* showed estrogen-like activity and propounded its use in hormone replacement therapy. Kakadia *et al.* (2019) reported the possibility of *Vitex negundo* seeds to treat polycystic ovarian syndrome.

The cytotoxic effect

The chloroform-soluble extract of the leaves of *Vitex negundo* to be toxic to a human cancer cell line panel (Díaz *et al.*, 2003). Cytotoxic effect of leaf extracts of *Vitex negundo* was analysed and declared using COLO-320 tumour cells (Smit *et al.*, 1995).

Anti-Venom Activity

The ability of hydroethanolic extracts of *Vitex negundo* leaves to neutralise the venom of *Daboia russelli* and *Naja naja* was reported by (Brindha *et al.*, 2014).

In vitro culture studies

Chowdhury *et al.* (2011) studied about the effects of phytohormones for callus induction in *Vitex negundo*. Leaves and internodes were used as explants. Murashige-Skoog's (MS) medium is used for culture. This callus induction procedure was effectively playing a role for large-scale culture and isolation of bioactive compounds from this plant. Kumar *et al.* (2018) developed an efficient protocol for regeneration of *Vitex negundo* which offers a great prospective to provide the requirements of diverse pharmaceutical industries and it enhanced in vitro regeneration of plants with combination of plant growth regulators such as BAP, KIN, TDZ, IBA and TIBA was observed. It was very helpful in understanding the callogenesis and organogenesis through the nodal explants and to smooth the progress of the mass propagation of *Vitex negundo*.

(Thiruvengadam & Jayabalan, 2000) reported that the shoot proliferation was obtained from shoot tips and nodal explants of *Vitex negundo* L. on MS medium supplemented with either BAP or KIN (0.1-2.0 mg/L) alone or in combination with NAA (0.1 mg/L). The concentrations of cytokinins combined with NAA produced multiple shoots from shoot tips and nodal explants. (Nisha Rani & Nair, 2006) established a rapid propagation protocol for shoot multiplication and callus regeneration of *Vitex negundo*. Shoot multiplication of *V. negundo* was induced by different concentrations of 1-phenyl-3-(1, 2, 3-thiadiazol-5-yl)-urea (TDZ), Benzyl adenine and 6-furfuryl amino purine separately along with 10% (v/v) coconut water.

CONCLUSION

Vitex negundo is one of the very essential plants which have broad applications in conventional systems of medicines. All parts of the plant, contains phytochemicals, which are some important bioactive agents. It reports a variety

of medicinal uses to the plant. Naturally accessible these resources provide valuable raw material for future modern scientific research. It revealed that *Vitex negundo* Linn. is a trendy medicine for human kind.

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